

TI - Fuel battery - incorporates flow path for fuel gas and flow path for oxidising agent gas switched to reverse in both directions

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PA - (TOKE) TOSHIBA KK

IC - H01M8/04

AB - J06203861 The fuel battery has a fuel gas system (11) with battery entrance and exit pipe (13, 15) with a change valve (14) and an oxidizing gas system (12) with battery entrance and exit pipe (16, 18) with change valve. Both the system valves (14, 17) are positioned where the entrance and exit pipe intersect.

- The fuel battery main part comprises many cells. The fuel gas flows in the fuel pole of cell and the oxidizing agent gas flows through the oxidizing agent pole, causing an electrochemical reaction which generates power. The flow of gases in the cell is reversed by changing the valve positions of the respective gases so that the flow changes.

- ADVANTAGE - Prevents degradation of cell by reversal of flow direction. Extended lifetime of fuel main part.

- (Dwg.1/3)

OPD - 1993-01-11

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える。単電池5の温度分布と密度分布とは劣化程度の分布にも依存しながら、切換え前とは異なった分布に落ち着き、単電池5の中で劣化しやすい温度および電流密度条件をもつ部分は移動したことになる。ある時間経過後、再度、ガスの流動方向を逆転すると、単電池5の劣化程度の分布に依存して、温度分布と電流密度分布とは変化し、劣化し易い箇所は移動する。

【0014】このように、ガスの流動方向を正逆の関係にある両方向に切換えることにより、単電池5の劣化部分はある位置に特定されず、その位置の劣化のみによって単電池5の寿命が制限されてしまうことがなくなる。したがって、燃料電池本体1の寿命を延ばすことができる。

【0015】

【実施例】以下、本発明の一実施例を図1(a)(b)を参照して説明する。燃料ガス系統11は単電池5の燃料極3に、また酸化剤ガス系統12は単電池5の酸化剤極4に接続されている。

【0016】燃料ガス系統11は電池入口管13と、燃料ガス切換弁14と電池出口管15とから構成され、同様に酸化剤ガス系統12は電池入口管16と、酸化剤ガス切換弁17と電池出口管18とからなる。

【0017】図に示す如く電池入口管13と電池出口管15とが交差する位置に燃料ガス切換弁14を配置して互いの経路を連通することができるようになっている。同様に電池入口管16と電池出口管18とが交差する位置に酸化剤ガス切換弁17に配置して互いの経路を連通することができる。

【0018】上記構成において、(a)における燃料ガス切換弁14の弁体は電池入口管13同士を連通しており、これを正流位置とする。また(b)においては電池入口

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管13と電池出口管15とを連通しており、これを逆流位置とする。同様に、(a)の酸化剤ガス切換弁17の弁体は電池入口管16同士を連通しており、これを正流位置とする。(b)においては電池入口管16と電池出口管17とを連通しており、これを逆流位置とする。

【0019】燃料電池発電プラントの運転中、燃料ガス切換弁14および酸化剤ガス切換弁17を操作して正流位置から逆流位置へ、また、逆流位置から正流位置へと時間の経過と共に切換えて行く。

【0020】これにより、時間と共に単電池5の中で劣化しやすい温度および電流密度条件をもつ部分を移動させることができ、劣化のみによって単電池5の寿命が制限を受けるのをなくすことが可能になる。

【0021】

【発明の効果】以上説明したように本発明は、単電池内の燃料ガスおよび酸化剤ガスの流動方向を正逆両方向に切換えるようにしたので、単電池の劣化部が特定されることがなくなり、燃料電池本体の寿命を延長できるという優れた効果を奏する。

20 【図面の簡単な説明】

【図1】本発明による燃料電池発電プラントの一実施例を示す構成図。

【図2】本発明の動作原理を説明するための図。

【図3】従来の燃料電池本体の一例を示す断面図。

【符号の説明】

5…単電池

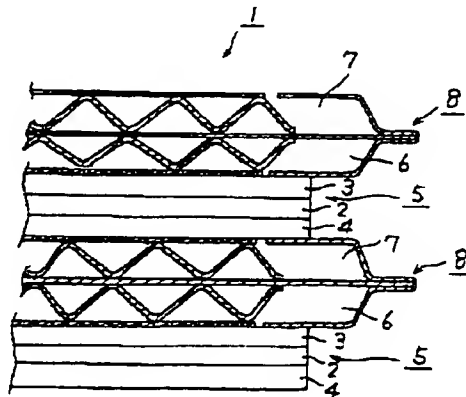
11…燃料ガス系統

12…酸化剤ガス系統

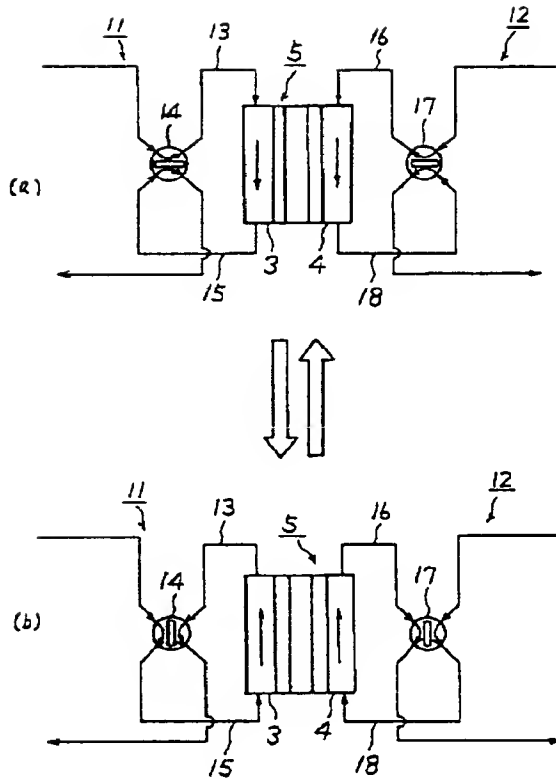
14…燃料ガス切換弁

30 17…酸化剤ガス切換弁

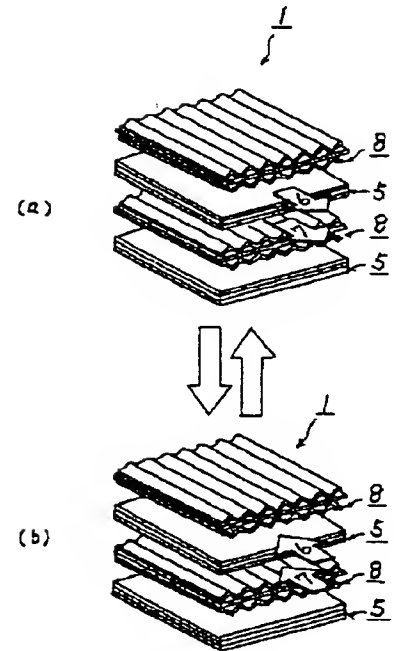
【図3】



【図1】



【図2】



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CLAIMS

[Claim]

[Claim 1] The fuel cell power generating plant characterized by preparing the fuel gas and the oxidizer gas system which have the passage changeover means which can be switched to right reverse both directions for the flow orientation of the fuel gas in the aforementioned cell, and oxidizer gas in the fuel cell power generating plant which connects both gas passageway and becomes so that it may have the fuel cell mainframe constituted by carrying out the laminating of many cells and oxidizer gas may be sent for fuel gas to the oxidizer pole of the aforementioned cell at the fuel electrode of the aforementioned cell.

DETAILED DESCRIPTION

[Detailed description]

[0001]

[Field of the Invention] This invention relates to a fuel cell power generating plant.

[0002]

[Prior art] A fuel cell is a power generation means to obtain a direct electric generating power from the electrochemical reaction produced on an electrode. In a fuel cell, in order to perform this electrochemical reaction continuously, you have to supply fuel gas and oxidizer gas to the fuel electrode and air pole which face each other on both sides of an electrolyte layer continuously, respectively.

[0003] An example of the configuration of a fuel cell is shown in drawing 3. The fuel cell mainframe 1 is equipped with the cell 5 which consists of an electrolyte layer 2, and the fuel electrode 3 and the oxidizer pole 4 which are arranged by sticking to the both sides, and fuel gas 6 and oxidizer gas 7 are supplied to both poles 3 and 4, respectively. Since the laminating of many cells 5 is carried out and they are constituted, the separator 8 for securing supply of each gas is used. This view shows typically the fuel cell mainframe 1 with which fuel gas 6 and oxidizer gas 7 are supplied to a cell 5 as a parallel current flow or a countercurrent flow. Both gas 6 and 7 flows and flows out in the orientation perpendicular to a drawing. The mixed gas which generally uses hydrogen as main components as fuel gas 6 is used, and the mixed gas which generally uses oxygen as main components as oxidizer gas 7 is used.

[0004] Oxygen and hydrogen react electrochemically within a cell 5, and start producing an electric generating power and a steam. Since it reacts while the hydrogen in fuel gas 6 and the oxygen in oxidizer gas 7 flow along with a cell 5, both gas 6 and the mole fraction of the hydrogen and oxygen in seven fall to a direction of flow gradually. Moreover, since fuel gas 6 and oxidizer gas 7 absorb generation of heat by the reaction, those temperature presents the temperature gradient to which it goes up to a direction of flow, and a cell 5 also goes up to the direction of flow of gas.

[0005] Electrochemical reaction becomes active so that the temperature of a cell 5 is generally so high that the mole fraction of the hydrogen in gas and oxygen is high. If electrochemical reaction is active, the current density produced in the fraction is large. Moreover, if electrochemical reaction is active, since the calorific value of the fraction by heat of reaction is large, the temperature of the fraction tends to become high. A cell 5 shows a distribution of temperature and current density according to the synergism of the concentration of both gas 6 and 7, and the liveliness of a reaction.

[0006] A cell 5 tends to deteriorate in the field exposed to the field or elevated temperature with high current density. Therefore, a degradation of a cell 5 advances locally in current density and temperature being [each other] related.

[0007]

[Object of the Invention] Thus, since a fuel cell presents the temperature distribution whose cell 5 included in on stream and the fuel cell mainframe 1 is not uniform, and a current density distribution, a degradation may advance locally in the fraction used as an elevated temperature or high current density.

[0008] The fuel cell mainframe 1 is divided into a parallel-current-flow type, a countercurrent-flow type, and three cross-flow type form according to the flow orientation of fuel gas 6 and oxidizer gas 7. A cell 5 has respectively characteristic temperature distribution and a current density distribution according to these formats.

[0009] Among these, as compared with the cell configuration of two form of others [configuration / cell / cross-flow type], a cell 5 has the characteristic feature which is easy to become an elevated temperature locally, and it is thought that advance of a degradation is early. Although the parallel-current-flow type cell configuration is excellent in order to make uniform the temperature distribution of a cell 5, and a current density distribution, a temperature gradient and current density inclination still cannot be made into zero. In order to aim at the reinforcement of a fuel cell, it is necessary to suppress a local degradation of a cell 5 to the minimum extent. Then, the purpose of this invention is about a degradation of a cell to offer the possible fuel cell power generating plant which restricts, suppresses and prolonged the life of a fuel cell mainframe.

[0010]

[The means for solving a technical problem] In order to attain the above-mentioned purpose, this invention is equipped with the fuel cell mainframe constituted by carrying out the laminating of many cells, and in the fuel cell power generating plant which connects both gas passageway and becomes so that oxidizer gas may be sent for fuel gas to the oxidizer pole of a cell at the fuel electrode of a cell, it is characterized by preparing the fuel gas and the oxidizer gas system which have the passage changeover means which can be switched to right reverse both directions for the flow orientation of the fuel gas in a cell, and oxidizer gas.

[0011]

[Operation] The principle of this invention is explained with reference to drawing 2.

[0012] This is what was applied to the parallel-current-flow type fuel cell mainframe 1, and the same is said of other countercurrent-flow types and the cross-flow type. With the separator 8, it is divided mutually and fuel gas 6 and oxidizer gas 7 are flowing both sides of a cell 5 in parallel. In (a), any gas is flowing from back to this side, and temperature is high in this side and it is in the inclination that a cell 5 has high temperature distribution by the lower-stream-of-a-river side of gas similarly. Since the reaction component of gas is reduced to a direction of flow, the density of the current produced by the reaction changes to a direction of flow. Furthermore, current density changes depending on the utilization factor and gas temperature of gas. Therefore, the degradation speed of a cell 5 changes by the upstream [of gas], and lower-stream-of-a-river side with the temperature distribution of a cell 5, and current density distributions, and the life of a cell 5 is restricted in the early fraction of a degradation.

[0013] Then, by the passage changeover means, as shown in (b), the flow orientation of both gas is switched to back from this side. It means that the temperature distribution and density distribution of a cell 5 settle in the distribution different from switching before, and had moved the fraction with the temperature and the current density conditions of being easy to deteriorate in a cell 5, being dependent also on the distribution about a degradation. After a certain time progress, again, if the flow orientation of gas is reversed, depending on the distribution about [of a cell 5] a degradation, temperature distribution and a current density distribution will change and will move in the part which is easy to deteriorate.

[0014] Thus, by switching the flow orientation of gas to the both directions in the relation of right reverse, the degradation fraction of a cell 5 is not specified as a certain position, but it is lost that the life of a cell 5 will be restricted by only degradation of the position. Therefore, the life of the fuel cell mainframe 1 can be prolonged.

[0015]

[Example] Hereafter, one example of this invention is explained with reference to drawing 1 (a) and (b). The fuel gas system 11 is connected to the fuel electrode 3 of a cell 5, and the oxidizer gas system 12 is connected to the oxidizer pole 4 of a cell 5.

[0016] The fuel gas system 11 consists of a cell inlet pipe 13, and the fuel gas change-over valve 14 and the cell outlet pipe 15, and the oxidizer gas system 12 consists of a cell inlet pipe 16, and the oxidizer gas change-over valve 17 and the cell outlet pipe 18 similarly.

[0017] The fuel gas change-over valve 14 can be arranged in the position where the cell inlet pipe 13 and the cell outlet pipe 15 cross as shown in drawing, and a mutual path can be ****ed now. It can arrange to the oxidizer gas change-over valve 17 in the position where the cell inlet pipe 16 and the cell outlet pipe 18 cross similarly, and a mutual path can be ****ed.

[0018] In the above-mentioned configuration, the valve of the fuel gas change-over valve 14 in (a) is ****ing cell inlet pipe 13 comrades, and considers this as a direct-flow position. Moreover, in (b), the cell inlet pipe 13 and the cell outlet pipe 15 are ****ed, and this is considered as a regurgitation position. Similarly, the valve of the oxidizer gas change-over valve 17 of (a) is ****ing cell inlet pipe 16 comrades, and considers this as a direct-flow position. In (b), the cell inlet pipe 16 and the cell outlet pipe 17 are ****ed, and this is considered as a regurgitation position. [0019] On stream, the fuel gas change-over valve 14, and the oxidizer gas change-over valve 17 of a fuel cell power generating plant are operated, and from a direct-flow position, again, it switches to a direct-flow position with the passage of time from a regurgitation position, and goes to a regurgitation position. [0020] The fraction which has by this the temperature and the current density conditions of being easy to deteriorate in a cell 5 with time can be moved, and it is enabled to lose that the life of a cell 5 receives a limit only by degradation.

[0021]

[Effect of the invention] As explained above, it is lost that the degradation section of a cell is specified of this invention since the flow orientation of the fuel gas in a cell and oxidizer gas was switched to right reverse both directions, and the outstanding effect that the life of a fuel cell mainframe is extensible is done so.

DESCRIPTION OF DRAWINGS

[An easy explanation of a drawing]

[Drawing 1] The block diagram showing one example of the fuel cell power generating plant by this invention.

[Drawing 2] Drawing for explaining the principle of operation of this invention.

[Drawing 3] The cross section showing an example of the conventional fuel cell mainframe.

[An explanation of a sign]

5 -- Cell

11 -- Fuel gas system

12 -- Oxidizer gas system

14 -- Fuel gas change-over valve

17 -- Oxidizer gas change-over valve